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123: 148304f Combustion characteristics of gas hybrid rockets. Mitsuno, Minoru; Kuwahara, Takuo; Odajima, Hiroaki; Kubozuka, Satoshi (Aerosp. Div., Nissan Motor Co., Ltd., Kawagoe, Japan 350-11). *Kayaku Gakkaishi* 1995, 56(3), 119-23 (Japan). The combustion characteristics of a gas-hybrid rocket using  $N_2O_4$  or  $N_2O$  as its oxidizer were studied both theor. and expt. The gas hybrid rocket obtains its thrust through the secondary combustion between the oxidizer and combustible hot gas produced by the primary combustion of a solid fuel in a gas generator. The theor. max. specific impulse ( $I_{sp}$ ) of  $N_2O_4$ /glycidyl azide polymer (GAP) was 265 s, and that of  $N_2O$ /GAP was 255 s. These values of  $I_{sp}$  are higher than those of conventional solid propellant rockets. The results of combustion tests carried out by using the small hybrid rocket firing test equipment show that when the gaseous products of decompn. of GAP fuel or those of ammonium perchlorate (AP) composite propellant were reacted with  $N_2O_4$  or  $N_2O$  oxidizers, ignition of the gas mixt. occurred rapidly and the subsequent combustion was stable. With  $N_2O_4$  or  $N_2O$  oxidizer, the hot gas from GAP fuel burned efficiently, so that secondary combustion efficiency was >93%. The efficiency of the secondary combustion between AP composite fuel and the same oxidizers was also >90%. These results showed that the gas-hybrid rocket can provide high combustion efficiency, and that esp. with GAP fuel, it achieved good combustion performance.

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